Performance of membranes for algae microfiltration, and biomass production and characterisation by thermal analysis

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Research on new technologies to produce biofuels from algae biomass is a promising mitigation strategy for reducing greenhouse gases. Photobioreactors associated with microfiltration membranes have been investigated as an alternative to promote biomass increase. The surface of the porous polymer membrane acts as a selective barrier, blocking the passage of microalgae, resulting in better system performance. In this research it was investigated the behavior of different membranes in the concentration and growth of Chlorella sp. A 3L capacity photobioreactor was conitnuously used for 7 days. Initially, glass microfiber membrane with average pore size of 10 µm was used as a pre-filter, showing a 50% retention of the algal biomass. Subsequently, polycarbonate membrane (TSTP, Millipore) with a nominal pore size of 2.0µm showed 20% more retention in relation to the previous membrane. To monitor algae growth, algae cells were counted under optical microscopy. Scanning electron microscopy (SEM) was used to characterize the membranes and evaluate the formation of a polarization layer on its surface. In the image obtained from the glass fiber filters clear pores were detected after 7 day trial, while in the TSTP membrane surface the pores were blocked, which proved its efficiency in biomass retention. To investigate about the viability of algal biomass for biofuel production, thermogravimetric analysis (DTA and DTG) under O2 atmosphere and TG were performed in the biomass. TG results showed that there are three stages of decomposition corresponding to moisture, volatile materials, carbonaceous materials and solid waste at the end of the process. DTA results showed main events with peaks at 360°C and 565°C denoting exothermic peaks whose enthalpy values were 741 Jg-1 and 797Jg-1 respectively. These features indicate that this material is a promising source for biofuel production.

Keywords: biomass, photobioreactor, membrane, *Chlorella sp*, thermal analysis.